

Planning for Sustainable Tourism



Part II: Infrastructure Overview Study

Recommendations

Prepared for



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Planning for Sustainable Tourism in Hawaii

Part 1: INFRASTRUCTURE & ENVIRONMENTAL OVERVIEW STUDY

RECOMMENDATIONS



Prepared for the State of Hawaii
Department of Business,
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and Tourism
By Carter & Burgess, Inc.

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PREFACE

Act 259 (2001 SLH) requested the Department of Business, Economic Development & Tourism (DBEDT) to conduct a study on Hawaii's carrying capacity for tourism. As part of that study the Department contracted with the firm of Carter and Burgess, Inc. to conduct a review of the State's infrastructure elements and environmental features to determine their capacity, usage, condition and the extent to which tourism may be affecting those parameters. The Carter & Burgess Report, *Planning For Sustainable Tourism in Hawaii: Part I, Infrastructure and Environmental Overview Study*, was submitted in Five volumes spanning about 1,000 pages at the end of December 2002.

In addition to the assessment of Hawaii's Infrastructure and selected environmental features, the report contained a number of recommendations based upon the assessment for the consideration of the state and counties. Those recommendations have been extracted from the report and are presented here. For convenience the recommendations are organized by both subject and geographical area.

These recommendations are solely the product and opinion of the consultant. The Department of Business, Economic Development & Tourism has taken no position on these recommendations, which are simply extracted from the larger report. Rather, it is making them more conveniently available for review, particularly by appropriate state and county agencies.

Please note that not all areas of the full report resulted in recommendations.

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I. Recommendations by Infrastructure Element and Environmental Feature Reviewed

Over Arching Recommendations

Two notable issues need to be addressed prior to delving into infrastructure recommendations – coordination and organization. There needs to be more effective and efficient coordination between various levels of government. Federal, state and county governments need to harmonize their labors. This will minimize duplication of manpower, and maximize funding. Coordination with involved outside stakeholders can also improve. This is especially noticeable in the beach erosion and invasive species environmental features. The various governmental levels for coastal zone management and invasive species appear a confusing, yet well-intentioned approach. Organization, as part of coordination, is needed to delineate a clear lead agency and define roles for other agencies and stakeholders. This is especially true for projects involving environmental features.

Public Infrastructure Elements

Terrestrial Water Quality and Quantity

State Summary

The term “sustainable yield” is used throughout the Water Summaries. According to the Commission on Water Resource Management, it means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the Water Commission.

Water quantities are approaching sustainable yields in some areas – most notably on Oahu, Molokai and West Hawaii. In these areas, alternative sources of potable water need to be identified. Alternative sources include water conservation measures, reallocation of potable water from communities that have not yet reached their sustainable yield, desalinization and water reclamation.

In other areas, permitted use has not reached sustainable yields. Most of the island of Kauai and Hana area permitted usage has not reached the sustainable yield for the aquifers on island. However, other problems exist. Reallocation of resources from the haves to the have-nots is a legitimate concern. Careful consideration should be taken. Aging infrastructure and remote lines make repairs and upgrades difficult. For Kauai, it is recommended to follow the repair / replacement schedule proposed.

Water quality needs to continue to be monitored. Hawaii has traditionally had a large agricultural contingent. Chemicals utilized in these areas are known to leach into the groundwater. Another source of concern is groundwater quality in areas of injection wells for disposal of wastewater.

Other water quality issues go to watershed or ahupuaa. Take care of forests that act as filtration for our water. Hawaii is lucky and has some of the high water quality. Caring for our watersheds and forests is part of caring for water quality. Issues related to this are invasive species and storm water drainage. Invasive species, such as *miconia*, take over environments. However, their shallow root system cannot withstand the stresses of the environment that native species can. Landslides occur and release sediment, which is detrimental to water quality. Storm water picks up loose sediment and non-point sources pollution and moves it into our water system and coastal waters. Non-point source pollution is one of the biggest environmental threats to Hawaii's waters.

City and County of Honolulu

Water quantities are approaching the sustainable yield for most communities. North Shore and the Koolau area are the exception; permitted use has not yet reached the sustainable yield. Water reclamation and alternative sources of potable water are needed. Water reclamation can satisfy non-potable water needs such as agricultural and industrial uses. Desalinization or other sources of potable water need to be identified and developed.

Continued monitoring of water quality is also needed. Agricultural chemicals, utilized over long periods, are present in some water sources. Water quality at the watershed should also be monitored. Oahu's forests and issues regarding native and invasive species are interrelated and can become problematic. Invasive species replace native species within the watershed to the detriment of water quality. (An example is *Miconia* in Tahiti. *Miconia* crowds out native species from the watershed. The shallow root system promotes landslides that release sediment and cloud water quality issues.)

County of Hawaii

Overall, there is more supply than demand for terrestrial water. However, West Hawaii, the driest part of the island, and the area with the lowest recharge is also the area with highest growth. The Kohala and Kona areas will see water restrictions before the rest of Hawaii, if exploratory wells with their corresponding distribution infrastructure do not keep ahead of demand. Aquifer levels will also need to be monitored to note any serious aquifer depletion. This could be a possible constraint for the visitor industry and development.

County of Maui

It is recommended that maximization of existing water sources by expanding storage capabilities be done. Management of the County's growth activities should be consistent with the water use and development. There is a need for continuing encouragement of water conservation practices by the County's residents to enable the most efficient use of existing water system sources and facilities. There is also a need for improvement of water transmission to areas that experience critical water supply and to seek new sources of water by exploration in conjunction with other government agencies.

Within each planning community, a comprehensive water management strategy must be developed to balance between the various interests and accommodate environmental, agricultural, and residential needs of all neighboring regions. There are limited development of water resources and distribution system to meet the needs of the region. There are concerns over the development of new ground water sources in Haiku and their reallocation of this resource to service other regions of the island. Exportation of resources found within the Hana Community includes the diversion of surface water from the region.

County of Kauai

Water quality and quantity for the Island of Kauai are acceptable at the current time. The amount of water being recharged exceeds the volume of water being used. Proactive measures to educate the public and well drillers should be taken to assure proper well drilling practices to avoid potential ground water contamination.

Kauai's water system faces some challenges for the immediate future. Water loss due to line leakage is commonplace. Aging and remotely located transmission and service lines make it difficult to keep up with the necessary repairs. Additional water supplies will need to be tapped to accommodate any growth. It is recommended that a thorough study of the water system infrastructure should be performed and a timeline to repair/ replace outdated water lines should be prepared.

Sewage

State Summary

Cesspools around the state are in varying conditions. These conditions relate to age, soil, proximity to fresh water sources and state. Connection to municipal sewer systems, while preferable, is not always economically feasible, especially in smaller rural communities. Lower-income homeowners are also less likely to be able to afford connection to municipal lines. Some regions in Hawaii County depend on on-site wastewater disposal systems and cesspools. Some of these do not satisfactorily treat the wastewater. It is recommended that a wastewater feasibility study be developed, which would aid in the recognition of deficient areas of treatment and in the placement of further infrastructure. At the other extreme, Kauai has untapped capacity for sewage at three of its four wastewater treatment plants. However, a long-term master plan should be developed prior to a modifications or approval of new developments.

Homeowners in areas surrounding sewage treatment plants would appreciate any dampening of air, noise and odor pollution. Landscaping can help.

City and County of Honolulu

There are a few recommendations regarding sewage on Oahu. Issues with available water can be solved through refining treatment of sewage. This allows effluent to be used for agricultural and industrial needs. Another issue is sewage leakage / salt-water intrusion, aging equipment and facilities and the use of cesspools. Aging sewage equipment, lines and facilities can no longer prevent sewage leaks and salt-water intrusion. These need to be repaired and or upgraded to the appropriate

capacity. Another upgrade is for homeowners with cesspools to connect to municipal sewer systems. Cesspools, depending upon the circumstances, can be public health hazard. Low-income homeowners may need financial assistance to be able to connect to the municipal system. Funding should be made available for them. Finally, homeowners in areas around sewage treatment plants would appreciate any dampening of odor problems and appropriate landscaping.

County of Hawaii

The Hilo and Kona regions have community sized wastewater treatment facilities, which currently are adequate for their wastewater disposal needs. The other regions in Hawaii County depend on on-site wastewater disposal systems and cesspools, which in most cases do not satisfactorily treat the wastewater.

It is recommended that a Hawaii County wastewater feasibility study be developed. The study should include the estimated future growth, development trends, a cost analysis for any proposed infrastructure, and a review of existing on-site wastewater disposal systems. The feasibility study would aid in the recognition of deficient areas of treatment and in the placement of future infrastructure.

County of Maui

The wastewater treatment facilities for Maui County are approaching their design capacity, which could potentially constrain future growth and development. With the continued growth on the island, the development of new wastewater treatment facilities will be needed to meet the new demands. Working with private landowners and exploring the possibility of entering into a partnership may develop additional transmission and treatment capacities.

County of Kauai

As recommended in the Kauai General Plan, 2000 the County of Kauai should develop a master plan for wastewater treatment focusing on strategic issues and funding priorities. The plan would provide direction to the program and provide a higher level of certainty for potential service customers.

It is recognized that the County has unused capacity in three of its four plants. It is also understood that connecting additional customers would increase revenues to the wastewater program at marginal cost for increased plant operations. However, Kauai County should complete a wastewater master plan prior to approving new development. This would insure that existing development can and will be served.

A review of the locations and frequency of failing on-site liquid waste systems should be tracked. The information should be used to make informed decisions about expansion of community wastewater collection systems.

Solid Waste Disposal

State Summary

Reduce, reuse, and recycle. All methods should be utilized to decrease the pace at which Hawaii is filling its landfills. Statewide and county efforts should be made to identify and address the issues involved with new landfill sites on each island. A master plan should then be developed at both the state and county levels for allocation and usage of the landfills. Further study should be conducted toward research about resource recovery and energy generation.

City and County of Honolulu

Reduction in packaging of consumer goods, reuse of non-recyclable materials and recycling can greatly reduce the amount of solid waste headed for landfills. Government encouragement of public recycling and recycling businesses should be promoted. These measures would lower the per-capita waste generation and stimulate the recycling business and increase the lifespan of landfills.

Another aspect of reducing solid waste is waste-to-energy or H-POWER. H-POWER converts solid waste into ash with the added benefit of needed energy generation as a byproduct. This should be encouraged.

County of Hawaii

The County of Hawaii Solid Waste Division is faced with many challenges. Both the State and County failed to meet the waste reduction goals for 1995 and 2000; the program is operating at a loss, the tipping fees only account for 35% of the Divisions budget; and illegal dumping of solid waste continues to be a problem. These challenges are being met with the encouragement of recycling programs, the consideration of curbside pickup, and tipping fees that are more in line with the actual cost of solid waste disposal.

It is recommended that a solid waste option plan be developed to provide potential alternatives and solutions to the existing problems. The plan should evaluate the existing transfer stations. A review of the transfer station locations and their usage should be considered. The study should consider potential ways to upgrade some of the transfer stations so waste could be compacted on site and more efficiently transferred to the landfill.

County of Maui

The Maui County General Plan recommends a comprehensive waste management program, which includes waste reduction, recycling, composting, and energy recovery/utilization. Consideration should be taken of environmental impact when developing new disposal sites. Additional recommendations include setting up convenient centers within the individual communities for recycling and reuse of solid waste and incentives for private business to establish operations within the county that promote reuse of disposed household items.

County of Kauai

The remaining life in Kauai's landfill is five to six years. Therefore, a new landfill site should be identified within the next year. Other alternatives to a new landfill should be considered, such as a resource recovery facility. The facility could provide electrical power and substantially reduce the volume of waste put in the landfill.

Because the number of visitors can be as great as 25% of the island population, programs to educate visitors about recycling should be considered. Hotels and visitor accommodations should provide their guest with convenient ways of recycling.

Storm Water***State Summary***

A significant problem with storm water is non-point sources pollution or polluted runoff. Non-point source pollution is any contaminant picked up by water from a variety of sources as it flows to the ocean. It is difficult to identify and is not easily controlled. This is one of Hawaii's biggest environmental threats. Continued monitoring of storm water, where possible, tracing non-point source pollution and enforcement of health violations is needed.

Retention and detention ponds for storm waters are needed. These helps with flood control and allow more water to infiltrate into the groundwater. This also allows for settling of debris and sediment and decreases pollution runoff. Master plans for storm water drainage are needed for all islands. Policy changes such as it relates to flood plain, high surf, and tsunami hazard areas need to be considered.

Tracking climate changes and the seasonality of storm water and drainage in conjunction with land use is key to non-point source pollution prevention.

City and County of Honolulu

Non-point source pollution is one of Oahu's greatest environmental concerns. Monitoring of storm water is needed along with enforcement of health code violations. Public awareness can reduce non-point source pollution. Any decrease in non-point source pollution means cleaner beaches, and fewer beach closures, especially after storms. Another method to reducing polluted beaches is through the use of retention ponds and wetlands that allow for settling and filtration of runoff. Storm water runoff is a source of aquifer replenishment when the water is given time to percolate through the soil and into the ground water.

County of Hawaii

The County of Hawaii has recognized many of the challenges it faces and has outlined a comprehensive list of future requirements. The changes the County is considering include but are not limited to a revision of the Drainage Master Plan, a review of land use policy as it relates to flood plain, high surf, and tsunami hazard areas.

No recommendations for Hawaii County Storm Water are forth coming at this time.

County of Maui

There was not enough information available to adequately evaluate and make recommendations for this infrastructure element. Further information is needed to be made available.

County of Kauai

It is recommended that rather than prepare a “master plan” for the island, the Department of Public Works focus on specific problem areas and watersheds, with the objective of developing strategic plans that specify preventive as well as remedial actions.

It is also recommended that the County’s drainage standards be revised to provide adequate flood protection that is not structure-oriented, and to reduce polluted runoff in accordance with State and Federal non-point pollution management policies. The standards will guide future development and aid in avoiding future problems.

Roads***State Summary***

The time it takes to commute to and from work for most residents has increased over the past decade. However, some places, like much of Oahu, have had difficulty in implementing plans to alleviate traffic problems until public support is behind such improvements.

Minor changes such as traffic signal synchronization and staggered work shifts can temporarily alleviate some traffic problems, but major changes are needed. The Bus system alleviates congestion. Consideration for expansion of The Bus through addition of more buses and routes should be noted.

Several studies have been done regarding transportation on all the islands. However, consideration of community, environmental and cultural concerns should also be taken into account. Areas, such as Ewa, with planned development will only add to the already congested highways. Alternative methods of transport are needed. Long Range Transportation Plans supporting projected growth should be implemented. It is also recommended that alternative funding sources be identified for future maintenance and new infrastructure.

City and County of Honolulu

No significant changes are scheduled to improve peak traffic congestion. There are several areas throughout Oahu that are currently bottlenecks (H1-H2 merge, Middle Street Merge, etc.) and the level of service is D-F grade. When gridlock occurs and the public demands improvements changes may occur. There is an immediate need for coordination between state and city transportation departments. Some minor recommendations may alleviate peak traffic congestions such as traffic light coordination, staggered work shifts, or enhanced bus schedules (more buses, express routes, etc.), alternative transportation methods, and enforcement of HOV

violations. The limited land resources make expansion of most roads economically and logistically difficult.

County of Hawaii

Federal and state funding for transportation projects are waning. It is recommended that alternative funding sources be identified for future maintenance and new infrastructure.

The Long Range Land Transportation Plan for the island of Hawaii, which identifies major transportation improvements to support projected growth through the year 2020 should be implemented.

County of Maui

Transportation is one of the major concerns in Maui County. However, policies developed in adjoining community plan regions should be consistent with the desire of surrounding communities to preserve the natural and cultural characteristics.

Problem areas include Kahului, Kihei and Lahaina. Kahului, as the center of commerce and hub for transportation routes often necessitates that people travel through Kahului to get where they want to go. The addition of alternate routes would alleviate much of the traffic through Kahului. Piilani Highway has alleviated much of the east-west traffic through Kihei; however, an alternative route is needed for north-south moving traffic. To relieve traffic in and around Lahaina passing lanes and a bypass are needed.

County of Kauai

Potential highway improvements should at least be assessed for feasibility and desirability given Kauai County's policy to maintain rural character. It is recommended that Kauai County wait for the Department of Transportation that is planning to prepare an updated 2025 land transportation plan prior to authorizing the design and construction of new roads. Potential projects should be analyzed and rated in terms of feasibility. Options such as adding new roads rather than widening existing ones should be considered.

Airports

State Summary

Current statistics show that the majority of passenger airports are underutilized; therefore, expansion of passenger terminals is not a current need. However, maintenance of passenger areas and modifications in organization and physical layout can maximize lease space and minimize passenger congestion and confusion within the airport.

There is a need to expand cargo facilities to get Hawaii's exports out. Monies should be spent toward improved cargo facilities, especially in Hilo, to support the diversified agricultural industry and export of Hawaii's goods.

City and County of Honolulu

The Honolulu International Airport was constructed based on optimistic projections of demand from the 1970-80's. A slower than projected growth in tourism as well as acceptance of international and mainland flights to outer islands leaves HIA with capacity. The effects of 9-11 have caused increased security that has changed flight travel expectations creating long lines at security and decreased sales for retail spaces. There is a need to maximize lease space and organize the facilities to efficiently move people by upgrading and expanding cargo facilities and reducing curbside traffic congestion.

County of Hawaii

Airports in the County of Hawaii are capable of meeting projected passenger demand. Hilo Airport was built with expectations of more passengers from overseas than it currently has. Monies should now be spent toward improved cargo facilities on East Hawaii to support the diversified agricultural industry, especially the export of papayas, coffee and flowers.

County of Maui

The islands of Maui, Molokai and Lanai are dependent upon outside sources for goods. There is a need to improve air transportation to and from each of the islands, especially air cargo facilities.

Alternative designs for Kahului airport expansion should be proposed to accommodate public opposition to the expansion of road to the airport. Expansion should include the need to upgrade cargo facilities.

County of Kauai

Though a runway extension is supported by the tourism industry to accommodate the larger planes used in mainland and international flights, the passenger activity level at the Kauai's primary airport in Lihue has decreased drastically in 2001 and tourism levels show slow growth for the island. Efforts to maximize revenue and customer service should be the focus of the airport. Concession and permitted development should be promoted and positioned in a logical manner to capture customer demand and increase services to the customer. Expanded customer offerings should target the inter-island traveler as Lihue Airport's main customer.

Harbors***State Summary***

Improvements, as outlined by the Harbors Division, should be implemented. Hilo, Kawaihae and Nawiliwili Harbors are in need of improvements. Expansion of Barber's Point as a commercial harbor will greatly alleviate congestion at Honolulu Harbor. Expansion and improvements of harbor facilities (Nawiliwili and Port Allen) need to be made to accommodate larger ships in Kauai. However, reopening of Honolulu's Keehi

channel to ship traffic should be studied further to determine the impact of the open channel on the reef runways.

As the cruise ship industry expands, there is also a need to improve and expand cruise ship terminals and facilities.

City and County of Honolulu

Honolulu Harbor is at capacity with strong competition for the limited number of berths and multiple uses for existing berths. Barbers Point Harbor should be improved to handle additional cargo ship arrivals and boat repair and maintenance facilities. Improvements should be made to the cruise ship arrival area and “tour boat” area. Proposals for re-opening of Keehi Channel should be coordinated with operations at Honolulu International Airport. Improvements in cargo terminals and on site storage are needed at Honolulu Harbor. Harbor administrative operations should be consolidated to one location.

County of Hawaii

It is recommended that the improvements outlined by the Harbors Division be implemented at both Hilo and Kawaihae Harbors. Hilo harbor should provide the same level of service as large harbors on the island of Oahu. There is little discussion regarding improvement to cruise ship terminals and facilities. This is an area of further study, as cruise ships are a growing segment of the visitor industry.

Small boat harbors in Hawaii are heavily utilized. Currently, there is a waiting list for mooring spaces. It is recommended that the small boat harbors charge comparable rates as those seen at private harbors. The increased revenue would allow for better maintenance and potentially provide new facilities to decrease the waiting list. It is important that sufficient funding is generated for future renovations and repairs.

County of Maui

As stated previously, as islands, Maui, Molokai and Lanai are dependent upon outside sources for goods. There is a need to improve and expand harbor facilities, for both cargo and cruise ships, on Lanai, Maui and Molokai. An upgrade at the Lahaina dock for visitors arriving by cruise ship is recommended. Improvements to the ferry terminal on Maui and Lanai would accommodate shuttles, water taxis and the ferry landing between Maui and Lanai.

County of Kauai

The improvements necessary to accept the increasing passenger and cargo levels at Kauai’s two commercial harbors in Nawiliwili and Port Allen are in berthing facilities and port infrastructure. The plans for these should be followed through. Pier extensions are needed to accommodate the increasing number of larger ships and barges serviced by the ports. Local infrastructure, especially roads and commercial space, must be improved and increased to support the higher level of activity.

Parks

State Summary

State and county parks are in need of alternative sources of funding to improve, and maintain park facilities. Improvements vary from design and construction of measures to alleviate crowding to expansion where possible. New capital works need to be put in place to control further degradation of the park system. Opportunities for funding do exist; however, further study is needed to determine the most economical and desirable method. Some possibilities include entrance fees, charging group/tour fees, and private concessions (snorkeling, and surfing rentals at beach parks, food).

Two other opportunities are developing mauka park facilities and encouraging developers to create parks within their developments. Mauka parks facilities can help alleviate congestion at beach parks. Developers of both residential and resort areas should be required to create and set aside funds for marinating recreational facilities within their developments.

City and County of Honolulu

Crowding is generally due to inadequate or undeveloped park acreage, facilities and amenities. Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. In the highly urbanized areas other sources of open space development are needed as acquisition of additional green space is economically infeasible. In high growth areas park dedication requirements should be enforced to ensure developers build neighborhood parks. Limited availability of coastline requires park lands be developed in mauka locations.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Honolulu County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

County of Hawaii

Crowding is generally due to inadequate or undeveloped park acreage, facilities and amenities. Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. Recreation programs requirements need to be taken into account in the developmental stages of the park planning process.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Hawaii County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

County of Maui

Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. Recreation programs requirements need to be taken into account in the developmental stages of the park planning process. One concern is that recreational needs not provided for in other community plan regions may result in a spillover effect into the Hana region. A concern for Lanai is the need for additional recreational facilities and services. Public park facilities in some regions are inadequate and in need of expansion and improvements. Existing public beach parks are well utilized and do not adequately meet public demand. The improvement and expansion of park facilities in the region have not kept pace with resident population growth.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Maui County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

County of Kauai

The Hawaii Tourism Product Assessment identified Kauai's park amenities such as restrooms, picnic areas, and trails as not being properly maintained. The assessment suggested that better service and maintenance at public areas could be achieved through privatization of certain park areas.

Kauai's parks will continue to see increased usage. The current trend of ecotourism will divert more visitors towards the natural settings of Hawaii in particular the parks and beaches of Kauai. Increased use will inevitably lead to over crowding, stressing of the natural environment and overuse of the infrastructure facilities. Maintenance and new capitol works need to be put in place to control any degradation of the park system.

Police, Fire and Emergency Services***State Summary***

Further long-range planning, cost projections and study of demographics within each district are vital to efficiently and strategically place manpower and emergency response equipment and facilities, especially for the County of Hawaii. The dispersed structure of various counties' resident and visitor populations stretches the limited resource of the police, fire, and emergency services from one end of the island to the other. Additional funding is needed to replace equipment and add satellite stations in locations consistent with long range growth plans.

City and County of Honolulu

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

Unfortunately, the number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Response to major traffic incidents is slow and causes traffic congestion. New threats in national security have increased the need for special personnel and equipment to respond to terrorism threats and HAZMAT.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities.

Increasing visitor awareness of various local hazards (heat stroke, getting lost on trails, ocean hazards) may reduce the number of tourist related incidents.

County of Hawaii

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

The number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Another reason is the enormous physical area with scattered settlements. Arriving at a scene in a timely manner is challenging.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities. Correlation between demographics and geography may shed light on differences between resident and visitor usage of emergency services.

County of Maui

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

Unfortunately, the number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Another reason is the enormous physical area with scattered settlements. Arriving at a scene in a timely manner is challenging.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities. Correlation between demographics and geography may shed light on differences between resident and visitor usage of emergency services.

County of Kauai

The dispersed location of Kauai's resident and visitor populations stretches the limited resources of the police, fire and emergency services from one end of the island to the other. Outdated fire equipment and facilities and DOW water supplying infrastructure further compromise the abilities of the Kauai fire department. Recommendation is for additional funding to replace equipment and add satellite stations in locations consistent with long range growth plans.

Private Infrastructure Elements

Visitor Accommodations

State Summary

The key to the future of visitor accommodations is to monitor visitor unit growth to assure that it does not outpace existing infrastructure growth. On Kauai, the supply of land designated for resort development is greater than the project demand. Another desire is for communities to maintain their character, whether rural or urban. In the case of rural character, the visitor accommodations should focus on small scale and alternative forms of lodging.

City and County of Honolulu

Visitor accommodations are privately owned and operated and development is in response to industry demand. Since Waikiki is considered built-out, expansion is being encouraged in downtown Honolulu and Kapolei areas. Generally development has been slow outside of Waikiki. Within Waikiki emphasis is on renovation of existing inventory.

County of Hawaii

Monitor growth in west Hawaii to assure that it does not outpace existing infrastructure capacities.

County of Maui

Maui is predominantly geared toward the deluxe/luxury resort setting, while Molokai and Lanai are mostly hotels. The main recommendation for visitor accommodations is

monitoring of current accommodations and appropriate planning for future developments.

County of Kauai

On Kauai, the supply of land designated for resort development is greater than the project demand under the 2020 scenarios discussed in the Kauai General Plan. Cost associated with development may be higher than other locations because of the challenges created by limited public infrastructure (no island wide sewer or water service and limited road access due to light duty bridges). The desire expressed in the Kauai Vision is for the island to maintain its rural character and that visitor accommodations should focus on small scale and alternative forms of lodging.

Private Transportation

State Summary

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii. Further research into the type of data needed and collection of that data is required.

City and County of Honolulu

Information on Private Transportation is difficult to get from privately held companies. This sector is heavily utilized by the visitor population and the assumption is that it will expand as demand requires. Information was limited to tax and licensing numbers.

County of Hawaii

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii County. Nevertheless, as privately run businesses, the industry will tend to expand to meet the demands of service calls.

Recommend monitoring of private transportation and data collection if a more thorough evaluation is desired.

County of Maui

There is insufficient information to adequately make recommendations for this infrastructure element.

County of Kauai

There is not enough information to adequately evaluate this infrastructure element. Data regarding private transportation would need to be collected to evaluate Private Transportation.

Energy Systems

State Summary

Statewide and county efforts should be made to identify and address the community, environmental and cultural issues involved with new energy generating sites on each

island. Further study, as recommended in the solid waste disposal section, should be conducted toward research about resource recovery and energy generation. Reduction in solid waste and generation of energy is a boon to both infrastructures. Additional power, especially on Hawaii Island, is greatly needed.

City and County of Honolulu

Growth is projected for Honolulu, Ewa, and Central Oahu and will create an increased demand for power. Additional power generation sources will be necessary in the future however as development continues to cover Oahu there will be difficulty in citing power generation facilities away from urban areas. Emphasis should be placed on demand side energy conservation programs as well as developing alternative sources of energy.

County of Hawaii

West Hawaii is the fast growing area in Hawaii County. As such, a new power source is needed. HELCO has been searching for a power plant site on West Hawaii since the 1980s. They have met with strong opposition. The County Council has recently approved rezoning of a site in West Hawaii for the near future development of a power plant. This could be a possible constraint to the visitor industry.

Energy systems recommendations are to fast track the additional power source once a site is approved; other considerations are energy conservation and utilization of more alternative and renewable energy sources.

(County of Maui)

Maui, as part of the State, is heavily reliant upon fossil fuels. It is recommended that a more self-sufficient approach be taken toward energy production. Conservation programs and renewable energy sources should be explored.

(County of Kauai)

Kauai Electric's distribution system is a typical radial system, and unlike KE's transmission looped system where there are at least two transmission lines feeding the major switchyards, if a distribution line is de-energized, there is usually an interruption of power. KE's radial distribution systems extend from substations to the load with no continuous backup. KE's distribution systems have alternate sources to feed an area, but brief outages occur due to switching that is necessary to reroute power from a different feeder or switchyard. It is recommended that the necessary redundancy be built into the system so interruptions in power can be avoided.

Sewer Systems

Many of the Hawaii County private sewer systems are owned and maintained by the resort management companies. Information regarding sewer systems is limited in availability.

(City and County of Honolulu)

The Sewer Systems indicator was combined with Sewage. There is a need to connect those household still having cesspools with county facilities.

County of Hawaii

Many of the private sewer systems are owned and maintained by the resort management companies. Aside from information gleaned from environmental impact statements, information regarding sewer systems is not found in county documents.

Recommend monitoring of private sewer systems and data collection if a more thorough evaluation is desired.

(County of Maui)

Sewer systems information is largely combined with public sewage. Information for individual sewer systems was not available. See Public Infrastructure, Sewage Recommendations.

(County of Kauai)

The Sewer Systems indicator has been combined with the Sewage indicator.

Environmental Features

Coastal Water Quality

The coastal water quality for Hawaii is excellent except when impaired by severe storms and construction where best management practices were not followed. The greatest threat to coastal water quality is non-point source pollution. Non-point source charges have a greater impact on streams and near shore waters than point source discharges. Effective monitoring of storm water discharge and enforcement of health violations is a step toward remedying this threat. Procedures to further control non-point supplies and identifying point source sources, especially upland of streams and bays should be taken. Educational programs, regarding the importance of coastal water quality and the uniqueness of Hawaii's natural marine environment, help.

(City and County of Honolulu)

The coastal water quality around Oahu is generally good. The major threat to the water quality is from non-point source pollution such as urban and agricultural run off. The waters off of Waikiki are exceptionally clean considering the highly urbanized land environment. The Ala Wai Canal is created with absorbing and filtering the majority of the areas non-point source pollution. Containment or treatment of storm water runoff should be used to ensure the high quality of Oahu's coastal waters.

County of Hawaii

The coastal water quality for Hawaii is excellent except when impaired by severe storms, cesspools and construction where best management practices were not followed. Recommendations include the provision of educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment.

(County of Maui)

As non-point source pollution is the greatest threat to coastal water quality, it is difficult to make coastal water quality recommendations without any information regarding storm water.

Ensure that best management practices are utilized to reduce the possibility of chemicals entering the water.

(County of Kauai)

While the currents surrounding the Island of Kauai move polluted water away from the coastal waters, the limited circulation of bay waters can cause them to become polluted. Non-point source discharges have a greater impact on streams and near shore waters than point source discharges. Control of water runoff from agriculture lands and urbanized areas such as the Nawiliwili and Port Allen harbors is an opportunity for the Island of Kauai. Kauai's unwritten policy to avoid construction of concrete-lined channels in preference of grassy drainage ways helps to improve coastal water quality. Procedures to further control non-point supplies and identifying point source sources, especially upland of streams and bays, should be taken.

Marine Ecosystem Health

Along with providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment, the County also needs to avoid over fishing along the coast, which creates localized depletion of various marine biota.

Reefs along less populated coasts show higher fish abundance and diversity than the more populated main Hawaiian Islands. Consideration should be given to promoting

County specific research into marine ecosystem health and designating unique or popular areas of Marine Life Conservation Districts.

(City and County of Honolulu)

The Marine Ecosystem Health indicator was combined with Coastal Water Quality

County of Hawaii

Recommendations include providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment. Also recommended is the creation of more marine conservation areas. The conservation areas would circumvent the problem of over fishing along the coast, which creates localized depletion of various marine biota.

(County of Maui)

Concerns regarding the carrying capacity of heavily used ocean recreation areas, like Molokini, are legitimate. Further study is required to determine the type of impacts heavy usage incurs upon more frequently used areas. Monitoring and the issuance of permits may be a recommendation of such a study. Another option is establishment of marine conservation areas for protection.

(County of Kauai)

Reefs along the Kauai coast show higher fish abundance and diversity than the other main Hawaiian Islands. The island has excellent and diverse fish habitats and fishing pressure is relatively low due to a smaller human population. The lack of Marine Life Conservation Districts and research on the reefs of Kauai presents opportunities for the island. Consideration should be given to promoting County specific research into marine ecosystem health and designating unique or popular areas Marine Life Conservation Districts. The excellent quality of Kauai's marine ecosystem is considered an essential component in the island's tourism product.

Forestry / Green Space

Sufficient funding must be provided to maintain the State reserves, forests and trails. Opportunities mentioned in the Parks section apply to Forests as well.

(City and County of Honolulu)

Urban green space areas should be enhanced through planting of trees and landscaping. Mauka areas of forestry should be maintained for their significant watershed and recreational contributions. In urbanized areas where green space is

not easily expanded there is an emphasis on open space such as plazas where alternative open air experiences can occur.

County of Hawaii

Recommendations for forestry include that more funding be directed toward the maintenance and upgrading of forest reserves and trails. The condition of the forest reserves directly effects water quality within the watershed.

(County of Maui)

Preservation and restoration of native forests is in the best interest of all stakeholders. Forests are the natural filters for groundwater, so in preserving forests, the groundwater quality is also preserved. Healthy forests also supports native species. Coordinated efforts between all stakeholders are recommended in conjunction with invasive species issues. These two issues are intertwined and should be treated together.

(County of Kauai)

Hawaii's forests are an important source of recreational opportunities and water resources. Forest watersheds supply Hawaii with almost all of the fresh water Hawaiians need. For the County of Kauai, there is not enough county specific data to make a proper assessment of the forestry and green space indicator. The recommendation is for detailed County specific data.

Air Quality

Overall, Hawaii's air quality is excellent. It is well above federal and State standards. There is a lack of major polluting industries and trade winds blow any air pollution out to sea. The biggest threat to air quality, especially in Hawaii County, is volcanic related haze and fog. On other islands, burning of sugarcane and vehicular emissions are of concern. Consideration should be given to diversifying the locations of monitoring stations in high-risk areas.

(City and County of Honolulu)

Though Oahu enjoys excellent air quality. Most air quality concerns occur in times of Kona weather and are caused by volcanic activity. Encouragement of alternative forms of transportation can contribute to a reduction in emissions and improvement in air quality in urbanized areas.

County of Hawaii

The biggest threat to air quality in Hawaii County is volcanic related haze and fog. The direction and speed of the tradewinds can help or impede the problem, depending upon one's location relative to the source. The majority of the time the tradewinds efficiently diffuses and reduces the intensity of the vog.

Recommendation includes continued monitoring of air quality.

(County of Maui)

Air quality on Maui is above federal and state standards. The major concern regarding air quality on Maui is when the sugarcane is burned. In general, vehicular emissions have not been a problem. Continued monitoring is recommended.

(County of Kauai)

Kauai's air quality meets federal and state environmental health standards because of the lack of major polluting industries and trade winds blowing the air pollution out to sea. The majority of air pollution on Kauai is currently attributed to agriculture operations; however, the increase in development especially the addition of diesel fired generating plants may change the source and content of air pollutants in future years. Consideration should be given to increasing the number of monitoring sites and the diversity of their locations.

Beach Erosion

The state owns the beaches, and as trustee of that resource, the state should take the lead in beach / coastal management. However, beach erosion is a naturally occurring phenomenon. It will continue to occur at varying rates on all islands. The best that can be done is to reduce the rate of erosion and mitigate any accelerated effects. Given that, the following recommendations regarding beach erosion are suggested.

- Organization and responsibility
 - Develop, fund, and empower a single lead state agency and county agencies to manage coastal erosion,
 - Enhance interagency at federal, state and county levels through coordination of research, manpower and funding,
 - Define of the shoreline and which agency is responsible for what areas within each island.
- Research
 - Develop a beach/shoreline monitoring program that should include the regular (every 5 years) collection of aerial photos or other means of determining the shoreline position at that time to integrate into a historical shoreline variability assessment model,

- Determine rate of retreat, conduct periodic field or aerial surveys.
- Study the economic factors governing the implementation and feasibility of various coastal management alternatives are poorly understood in Hawaii,
- Establish and maintain a comprehensive coastal shoreline survey, database, and research products resulting from technical studies of coastal processes and sand resources.
- Management plan
 - Simplify the permit process,
 - Create the master plan for state erosion management addressing the nature and cause of erosion problems, problem assessment, and immediate, medium, and long-term mitigating activities.
 - There are five options for erosion management: abandon the shoreline, restore the beach, control erosion rate with sand fill and structures, adapt human occupancy to accommodate erosion, and hardening the shoreline. Each option has its pluses and minuses. Abandoning a shoreline allows nature to take its course, but is impractical on heavily developed areas. Beach restoration may be the most desirable in some localities, however it is not a one-time cost, but an on-going process. Controlling the erosion rate is expensive and communities may reject the structures. Adaptation to accommodate erosion is difficult, often impractical and requires new zoning regulations and procedures. Hardening the shoreline results in beach loss, access decreased, and other environmental impacts. ^{203,2002}
 - Decision-making authorities and regulators need clear and unambiguous information on littoral processes, sand resources, historical erosion and accretion rates and projected future patterns, development patterns, land ownership histories, land-use trends, structure permitting histories, and other scientific and socio-economic trends and patterns at areas where erosion management decisions must be made.
 - Develop technical guidance Manual that provides direction or the development, restoration, and redevelopment of the coastline.
 - Develop a technical approach to control interim coastal erosion on residential lands where a short-term or seasonal wave-related erosion hazard exists, and where long-term erosion trends have created user conflicts.
 - Distribute the cost of preventive erosion measures between the State, counties and coastal landowners.
- Policy and enforcement
 - Establish a minimum setback and building requirements for all new construction.
 - Enforce more strictly all regulations affecting coastal development and beach preservation.
 - Adopt or alter for adoption, the OEQC guidelines for Environmental Assessment of shoreline projects that were

submitted for public commentary in the 11/23/95 OEQC Environmental Notice.

- Remove illegal shoreline structures.
- Prohibit the use of vertical seawall structures in areas where this form of protection is not wide-spread and where future seawall requests are likely.

(City and County of Honolulu)

Beach erosion is a natural phenomena that is accelerated by human impacts. The Island of Oahu has the highest rate of beach erosion in the state. More research on beach erosion and better management practices to control the process are needed. Reduction of shoreline hardening through increases in building setbacks and removal of illegal structures are recommended. The use alternative methods of structure and dune protection such as beach replenishment should be considered before shoreline hardening occurs.

County of Hawaii

There is insufficient information to provide accurate recommendations at the County level. Recommendation is for additional research for two purposes – to establish a baseline data set for beach erosion and to give support to management and their policies and practices.

(County of Maui)

As recommended at the State level, further research is required to study and develop appropriate management strategies for each area. Appropriate building setbacks and other policies need to be implemented and enforced.

See Hawaii State Recommendations for additional Beach Erosion Recommendations.

(County of Kauai)

Coastal erosion does not impact the Island of Kauai to the same extent that it does the other more heavily developed islands of the State of Hawaii. The lack of a present threat to beach health may be the reason the County of Kauai maintains a 40-foot setback for coastal construction while other Counties have increased their requirements. Consideration should be given to increasing the shoreline setback for the Island of Kauai especially in the more developed and sensitive areas of Poipu Beach, Haena and Hanalei Bay. The County of Kauai should continue permitting, monitoring and enforcing codes relating to construction in Special Management Areas especially those impacting seawalls, eroding shorelines, and beach accesses. High

quality of beaches and access to them is considered essential to Hawaii's visitor industry.

Invasive Species

The silent invasion of Hawaii by insects, disease organisms, snakes, weeds, and other pests is the single greatest threat to Hawaii's economy and natural environment and the health and lifestyle of Hawaii's people. Stopping the influx of new pests and containing their spread is essential to Hawaii's future well being. One of the most cost-effective solutions to this problem is to find and eradicate these species before they proliferate beyond control. This avoids the damage costs created by the pests themselves as well as the costs of perpetual pest control and mitigation.

A critical need is directed leadership and coordinated actions among all state agencies. The State currently lacks an adequate rapid response capability but has been involved in multi-agency efforts to fill this gap using multi-partner Invasive Species Committees, which have been formed on Oahu, Maui, and Hawaii islands. Continued support of these committees is critical as they represent innovative and cost-effective models of governmental partnerships.

Although inadequate funding is a major impediment to effective invasive species prevention and control, State laws also do not address the problem in a comprehensive and coordinated fashion. Consequently, gaps in authority and lack of clear policy direction hinder efforts to prevent and eliminate alien species invasions.

It is recommended for the State to garner public support for programs, through public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

(City and County of Honolulu)

Increased public and visitor awareness of the damaging effects of invasive species is considered the most effective means of controlling invasive species. Enforcement of quarantines and more thorough inspections of materials entering from areas known to have invasive species is necessary. The eradication programs and monies of government and various special interest groups should be coordinated to reduce the duplication of efforts.

County of Hawaii

Recommendations include maintaining and enforcing the quarantine program and review the quarantine and noxious species law. Coordination of manpower and funding by formulation of a consortium of governmental and other interested parties can maximize resources. Identification of infestations and regular performance

assessments of the successes and failures of eradication programs can aid in stopping the spread of problems.

Also recommended is the garnering of public support for programs, though public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

(County of Maui)

There are two primary recommendations regarding invasive species, coordination and eradication. Coordination between governmental agencies and other stakeholders will minimize duplication of efforts and maximize funding. Eradication involves eliminating what can be eliminated and containing what cannot be wholly eliminated.

(County of Kauai)

Most invasive species of flora arrive in Hawaii via introduction for horticulture use for ornamental purposes. Education of suppliers and residents is the most effective means of controlling invasive species introductions and preventing new potentially devastating alien species from coming to Hawaii. Once established containment and eradication become the more challenging task. The Island of Kauai has been cleared from incipient *Miconia* populations. The recommendation is for a strong community education program and survey of lowlands, the principal points of entry of most introductions to the Islands, and higher elevations where non-tropical ornamentals may flourish.

Other Appropriate Natural and Scenic Resources

Scenic Resources

Hawaii is known for its scenic beauty and variety in environments. However, there is little documentation of the scenic beauty. This may be due to the difficulty in quantifying scenery. It is recommended that public input be gathered to establish perception of the scenic quality in Hawaii until further research of quantitative value can be conducted.

(City and County of Honolulu)

Oahu has many natural and scenic resources that must be protected.

County of Hawaii

There is insufficient information to provide detailed recommendations at the County level, however it is recognized that the aesthetic pleasing features of Hawaii attract

many tourist each year. Recommend that scenic resources be reviewed by public input until more quantitative measures are utilized.

(County of Maui)

Efforts are underway in various planning communities to restore environmental resources, including native vegetation. It is recommended that the natural and agricultural settings be maintained and enhanced.

(County of Kauai)

Kauai is known for scenic beauty and variety in landscapes. Kauai is the only county that dedicates a section of its General Plan entirely to scenic resources. These features attract visitors from around the world, and therefore, have an economic value. The Kauai General Plan states the goal of Kauai to retain the cultural and economic value of various landscape features. The recommendation is for the Planning Department to provide specific criteria and guidelines for evaluation and protection of scenic views.

Riparian / Wetlands

The biggest threat to riparian zones and wetlands, as mentioned in storm water and coastal water quality sections, is non-point source pollution. Please see recommendations for those sections.

(City and County of Honolulu)

Non-point source pollution is biggest environmental threat to island wetlands. Invasive species are more prominent in coastal areas (wetlands) than at higher elevations; thus decreasing the effect of wetlands as an ecological water filter.

County of Hawaii

Only recently has the status of the state streams been brought to light. Recommend continued monitoring of the preliminary research and actions will help ensure the restorative programs stay on course.

(County of Maui)

See Coastal Water Quality recommendations

(County of Kauai)

No recommendation was made by Carter and Burgess.

Native Species and Extinction Issues

Extinction, endangered and threatened status of various species is a threat to Hawaii's environment. Laws and appropriate management policies have been established to protect native endangered and threatened species. However, inadequate funding does not allow for adequate enforcement. Public awareness programs directed toward both visitors and residents about the plight of Hawaii's environment can help.

(City and County of Honolulu)

Native species are threatened by habitat destruction and through competition for food from invasive species. Emphasis should be on protection of ecosystems as a whole instead of particular individuals or species. Increased funding is need for research and sampling/propagation of threatened species. Encourage the use of native plant species that are adjusted to Hawaii's climate as compared to water thirsty plants and invasive species. Amnesty bins programs should be expanded.

County of Hawaii

The Invasive Species Committee is a new organization. Recommend monitoring their progress in the fight against invasive species.

(County of Maui)

Restoration and preservations of native forests will benefit native species. As a whole, the County of Maui is progressive in its response to invasive species and protection of native species. Lanai has little native vegetation remaining and of what is remaining, it is threatened.

(County of Kauai)

Hawaii has one-third of the endangered species in the United States, and invasive alien species pose the greatest threats driving these and other native species toward extinction. For Kauai, there is not enough county specific data to make a proper assessment of the Native Species / Extinction Issues indicator. The recommendation is for detailed County specific data.

II. Recommendations by State and County Areas

Statewide Summary

Public Infrastructure Elements

Terrestrial Water Quality and Quantity

The term “sustainable yield” is used throughout the Water Summaries. According to the Commission on Water Resource Management, it means the maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the Water Commission.

Water quantities are approaching sustainable yields in some areas – most notably on Oahu, Molokai and West Hawaii. In these areas, alternative sources of potable water need to be identified. Alternative sources include water conservation measures, reallocation of potable water from communities that have not yet reached their sustainable yield, desalinization and water reclamation.

In other areas, permitted use has not reached sustainable yields. Most of the island of Kauai and Hana area permitted usage has not reached the sustainable yield for the aquifers on island. However, other problems exist. Reallocation of resources from the haves to the have-nots is a legitimate concern. Careful consideration should be taken. Aging infrastructure and remote lines make repairs and upgrades difficult. For Kauai, it is recommended to follow the repair / replacement schedule proposed.

Water quality needs to continue to be monitored. Hawaii has traditionally had a large agricultural contingent. Chemicals utilized in these areas are known to leach into the groundwater. Another source of concern is groundwater quality in areas of injection wells for disposal of wastewater.

Other water quality issues go to watershed or ahupuaa. Take care of forests that act as filtration for our water. Hawaii is lucky and has some of the high water quality. Caring for our watersheds and forests is part of caring for water quality. Issues related to this are invasive species and storm water drainage. Invasive species, such as *miconia*, take over environments. However, their shallow root system cannot withstand the stresses of the environment that native species can. Landslides occur and release sediment, which is detrimental to water quality. Storm water picks up loose sediment and non-point sources pollution and moves it into our water system and coastal waters. Non-point source pollution is one of the biggest environmental threats to Hawaii’s waters.

Sewage

Cesspools around the state are in varying conditions. These conditions relate to age, soil, proximity to fresh water sources and state. Connection to municipal sewer systems, while preferable, is not always economically feasible, especially in smaller rural communities. Lower-income homeowners are also less likely to be able to afford connection to municipal lines. Some regions in Hawaii County depend on on-site wastewater disposal systems and cesspools. Some of these do not satisfactorily treat the wastewater. It is recommended that a wastewater feasibility study be developed, which would aid in the recognition of deficient areas of treatment and in the placement of further infrastructure. At the other extreme, Kauai has untapped capacity for sewage at three of its four wastewater treatment plants. However, a long-term master plan should be developed prior to a modifications or approval of new developments.

Homeowners in areas surrounding sewage treatment plants would appreciate any dampening of air, noise and odor pollution. Landscaping can help.

Solid Waste Disposal

Reduce, reuse, and recycle. All methods should be utilized to decrease the pace at which Hawaii is filling its landfills. Statewide and county efforts should be made to identify and address the issues involved with new landfill sites on each island. A master plan should then be developed at both the state and county levels for allocation and usage of the landfills. Further study should be conducted toward research about resource recovery and energy generation.

Storm Water

A significant problem with storm water is non-point sources pollution or polluted runoff. Non-point source pollution is any contaminant picked up by water from a variety of sources as it flows to the ocean. It is difficult to identify and is not easily controlled. This is one of Hawaii's biggest environmental threats. Continued monitoring of storm water, where possible, tracing non-point source pollution and enforcement of health violations is needed.

Retention and detention ponds for storm waters are needed. These helps with flood control and allow more water to infiltrate into the groundwater. This also allows for settling of debris and sediment and decreases pollution runoff. Master plans for storm water drainage are needed for all islands. Policy changes such as it relates to flood plain, high surf, and tsunami hazard areas need to be considered.

Tracking climate changes and the seasonality of storm water and drainage in conjunction with land use is key to non-point source pollution prevention.

Roads

The time it takes to commute to and from work for most residents has increased over the past decade. However, some places, like much of Oahu, have had difficulty in implementing plans to alleviate traffic problems until public support is behind such improvements.

Minor changes such as traffic signal synchronization and staggered work shifts can temporarily alleviate some traffic problems, but major changes are needed. The Bus system alleviates congestion. Consideration for expansion of The Bus through addition of more buses and routes should be noted.

Several studies have been done regarding transportation on all the islands. However, consideration of community, environmental and cultural concerns should also be taken into account. Areas, such as Ewa, with planned development will only add to the already congested highways. Alternative methods of transport are needed. Long Range Transportation Plans supporting projected growth should be implemented. It is also recommended that alternative funding sources be identified for future maintenance and new infrastructure.

Airports

Current statistics show that the majority of passenger airports are underutilized; therefore, expansion of passenger terminals is not a current need. However, maintenance of passenger areas and modifications in organization and physical layout can maximize lease space and minimize passenger congestion and confusion within the airport.

There is a need to expand cargo facilities to get Hawaii's exports out. Monies should be spent toward improved cargo facilities, especially in Hilo, to support the diversified agricultural industry and export of Hawaii's goods.

Harbors

Improvements, as outlined by the Harbors Division, should be implemented. Hilo, Kawaihae and Nawiliwili Harbors are in need of improvements. Expansion of Barber's Point as a commercial harbor will greatly alleviate congestion at Honolulu Harbor. Expansion and improvements of harbor facilities (Nawiliwili and Port Allen) need to be made to accommodate larger ships in Kauai. However, reopening of Honolulu's Keehi channel to ship traffic should be studied further to determine the impact of the open channel on the reef runways.

As the cruise ship industry expands, there is also a need to improve and expand cruise ship terminals and facilities.

Parks

State and county parks are in need of alternative sources of funding to improve, and maintain park facilities. Improvements vary from design and construction of measures

to alleviate crowding to expansion where possible. New capital works need to be put in place to control further degradation of the park system. Opportunities for funding do exist; however, further study is needed to determine the most economical and desirable method. Some possibilities include entrance fees, charging group/tour fees, and private concessions (snorkeling, and surfing rentals at beach parks, food).

Two other opportunities are developing mauka park facilities and encouraging developers to create parks within their developments. Mauka parks facilities can help alleviate congestion at beach parks. Developers of both residential and resort areas should be required to create and set aside funds for marinating recreational facilities within their developments.

Police, Fire and Emergency Services

Further long-range planning, cost projections and study of demographics within each district are vital to efficiently and strategically place manpower and emergency response equipment and facilities, especially for the County of Hawaii. The dispersed structure of various counties' resident and visitor populations stretches the limited resource of the police, fire, and emergency services from one end of the island to the other. Additional funding is needed to replace equipment and add satellite stations in locations consistent with long range growth plans.

Private Infrastructure Elements

Visitor Accommodations

The key to the future of visitor accommodations is to monitor visitor unit growth to assure that it does not outpace existing infrastructure growth. On Kauai, the supply of land designated for resort development is greater than the project demand. Another desire is for communities to maintain their character, whether rural or urban. In the case of rural character, the visitor accommodations should focus on small scale and alternative forms of lodging.

Private Transportation

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii. Further research into the type of data needed and collection of that data is required.

Energy Systems

Statewide and county efforts should be made to identify and address the community, environmental and cultural issues involved with new energy generating sites on each island. Further study, as recommended in the solid waste disposal section, should be conducted toward research about resource recovery and energy generation.

Reduction in solid waste and generation of energy is a boon to both infrastructures. Additional power, especially on Hawaii Island, is greatly needed.

Sewer Systems

Many of the Hawaii County private sewer systems are owned and maintained by the resort management companies. Information regarding sewer systems is limited in availability.

Environmental Features

Coastal Water Quality

The coastal water quality for Hawaii is excellent except when impaired by severe storms and construction where best management practices were not followed. The greatest threat to coastal water quality is non-point source pollution. Non-point source charges have a greater impact on streams and near shore waters than point source discharges. Effective monitoring of storm water discharge and enforcement of health violations is a step toward remedying this threat. Procedures to further control non-point supplies and identifying point source sources, especially upland of streams and bays should be taken. Educational programs, regarding the importance of coastal water quality and the uniqueness of Hawaii's natural marine environment, help.

Marine Ecosystem Health

Along with providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment, the County also needs to avoid over fishing along the coast, which creates localized depletion of various marine biota.

Reefs along less populated coasts show higher fish abundance and diversity than the more populated main Hawaiian Islands. Consideration should be given to promoting County specific research into marine ecosystem health and designating unique or popular areas of Marine Life Conservation Districts.

Forestry / Green Space

Sufficient funding must be provided to maintain the State reserves, forests and trails. Opportunities mentioned in the Parks section apply to Forests as well.

Air Quality

Overall, Hawaii's air quality is excellent. It is well above federal and State standards. There is a lack of major polluting industries and trade winds blow any air pollution out to sea. The biggest threat to air quality, especially in Hawaii County, is volcanic related haze and fog. On other islands, burning of sugarcane and vehicular emissions are of concern. Consideration should be given to diversifying the locations of monitoring stations in high-risk areas.

Beach Erosion

The state owns the beaches, and as trustee of that resource, the state should take the lead in beach / coastal management. However, beach erosion is a naturally occurring phenomenon. It will continue to occur at varying rates on all islands. The best that

can be done is to reduce the rate of erosion and mitigate any accelerated effects. Given that, the following recommendations regarding beach erosion are suggested.

- Organization and responsibility
 - Develop, fund, and empower a single lead state agency and county agencies to manage coastal erosion,
 - Enhance interagency at federal, state and county levels through coordination of research, manpower and funding,
 - Define of the shoreline and which agency is responsible for what areas within each island.
- Research
 - Develop a beach/shoreline monitoring program that should include the regular (every 5 years) collection of aerial photos or other means of determining the shoreline position at that time to integrate into a historical shoreline variability assessment model,
 - Determine rate of retreat, conduct periodic field or aerial surveys.
 - Study the economic factors governing the implementation and feasibility of various coastal management alternatives are poorly understood in Hawaii,
 - Establish and maintain a comprehensive coastal shoreline survey, database, and research products resulting from technical studies of coastal processes and sand resources.
- Management plan
 - Simplify the permit process,
 - Create the master plan for state erosion management addressing the nature and cause of erosion problems, problem assessment, and immediate, medium, and long-term mitigating activities.
 - There are five options for erosion management: abandon the shoreline, restore the beach, control erosion rate with sand fill and structures, adapt human occupancy to accommodate erosion, and hardening the shoreline. Each option has its pluses and minuses. Abandoning a shoreline allows nature to take its course, but is impractical on heavily developed areas. Beach restoration may be the most desirable in some localities, however it is not a one-time cost, but an on-going process. Controlling the erosion rate is expensive and communities may reject the structures. Adaptation to accommodate erosion is difficult, often impractical and requires new zoning regulations and procedures. Hardening the shoreline results in beach loss, access decreased, and other environmental impacts.
 - Decision-making authorities and regulators need clear and unambiguous information on littoral processes, sand resources, historical erosion and accretion rates and projected future patterns, development patterns, land ownership histories, land-use trends, structure permitting histories, and other scientific and socio-economic trends and patterns at areas where erosion management decisions must be made.
 - Develop technical guidance Manual that provides direction on the development, restoration, and redevelopment of the coastline.

- Develop a technical approach to control interim coastal erosion on residential lands where a short-term or seasonal wave-related erosion hazard exists, and where long-term erosion trends have created user conflicts.
 - Distribute the cost of preventive erosion measures between the State, counties and coastal landowners.
- Policy and enforcement
 - Establish a minimum setback and building requirements for all new construction.
 - Enforce more strictly all regulations affecting coastal development and beach preservation.
 - Adopt or alter for adoption, the OEQC guidelines for Environmental Assessment of shoreline projects that were submitted for public commentary in the 11/23/95 OEQC Environmental Notice.
 - Remove illegal shoreline structures.
 - Prohibit the use of vertical seawall structures in areas where this form of protection is not wide-spread and where future seawall requests are likely.

Invasive Species

The silent invasion of Hawaii by insects, disease organisms, snakes, weeds, and other pests is the single greatest threat to Hawaii's economy and natural environment and the health and lifestyle of Hawaii's people. Stopping the influx of new pests and containing their spread is essential to Hawaii's future well being. One of the most cost-effective solutions to this problem is to find and eradicate these species before they proliferate beyond control. This avoids the damage costs created by the pests themselves as well as the costs of perpetual pest control and mitigation.

A critical need is directed leadership and coordinated actions among all state agencies. The State currently lacks an adequate rapid response capability but has been involved in multi-agency efforts to fill this gap using multi-partner Invasive Species Committees, which have been formed on Oahu, Maui, and Hawaii islands. Continued support of these committees is critical as they represent innovative and cost-effective models of governmental partnerships.

Although inadequate funding is a major impediment to effective invasive species prevention and control, State laws also do not address the problem in a comprehensive and coordinated fashion. Consequently, gaps in authority and lack of clear policy direction hinder efforts to prevent and eliminate alien species invasions.

It is recommended for the State to garner public support for programs, through public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

Other Appropriate Natural and Scenic Resources

Scenic Resources

Hawaii is known for its scenic beauty and variety in environments. However, there is little documentation of the scenic beauty. This may be due to the difficulty in quantifying scenery. It is recommended that public input be gathered to establish perception of the scenic quality in Hawaii until further research of quantitative value can be conducted.

Riparian / Wetlands

The biggest threat to riparian zones and wetlands, as mentioned in storm water and coastal water quality sections, is non-point source pollution. Please see recommendations for those sections.

Native Species and Extinction Issues

Extinction, endangered and threatened status of various species is a threat to Hawaii's environment. Laws and appropriate management policies have been established to protect native endangered and threatened species. However, inadequate funding does not allow for adequate enforcement. Public awareness programs directed toward both visitors and residents about the plight of Hawaii's environment can help.

City and County of Honolulu

Public Infrastructure

Terrestrial Water Supply Quality and Quantity

Water quantities are approaching the sustainable yield for most communities. North Shore and the Koolau area are the exception; permitted use has not yet reached the sustainable yield. Water reclamation and alternative sources of potable water are needed. Water reclamation can satisfy non-potable water needs such as agricultural and industrial uses. Desalinization or other sources of potable water need to be identified and developed.

Continued monitoring of water quality is also needed. Agricultural chemicals, utilized over long periods, are present in some water sources. Water quality at the watershed should also be monitored. Oahu's forests and issues regarding native and invasive species are interrelated and can become problematic. Invasive species replace native species within the watershed to the detriment of water quality. (An example is Miconia in Tahiti. Miconia crowds out native species from the watershed. The shallow root system promotes landslides that release sediment and cloud water quality issues.)

Sewage

There are a few recommendations regarding sewage on Oahu. Issues with available water can be solved through refining treatment of sewage. This allows effluent to be

used for agricultural and industrial needs. Another issue is sewage leakage / salt-water intrusion, aging equipment and facilities and the use of cesspools. Aging sewage equipment, lines and facilities can no longer prevent sewage leaks and salt-water intrusion. These need to be repaired and or upgraded to the appropriate capacity. Another upgrade is for homeowners with cesspools to connect to municipal sewer systems. Cesspools, depending upon the circumstances, can be public health hazard. Low-income homeowners may need financial assistance to be able to connect to the municipal system. Funding should be made available for them. Finally, homeowners in areas around sewage treatment plants would appreciate any dampening of odor problems and appropriate landscaping.

Solid Waste Disposal

Reduction in packaging of consumer goods, reuse of non-recyclable materials and recycling can greatly reduce the amount of solid waste headed for landfills. Government encouragement of public recycling and recycling businesses should be promoted. These measures would lower the per-capita waste generation and stimulate the recycling business and increase the lifespan of landfills.

Another aspect of reducing solid waste is waste-to-energy or H-POWER. H-POWER converts solid waste into ash with the added benefit of needed energy generation as a byproduct. This should be encouraged.

Storm Water

Non-point source pollution is one of Oahu's greatest environmental concerns. Monitoring of storm water is needed along with enforcement of health code violations. Public awareness can reduce non-point source pollution. Any decrease in non-point source pollution means cleaner beaches, and fewer beach closures, especially after storms. Another method to reducing polluted beaches is through the use of retention ponds and wetlands that allow for settling and filtration of runoff. Storm water runoff is a source of aquifer replenishment when the water is given time to percolate through the soil and into the ground water.

Roads

No significant changes are scheduled to improve peak traffic congestion. There are several areas throughout Oahu that are currently bottlenecks (H1-H2 merge, Middle Street Merge, etc.) and the level of service is D-F grade. When gridlock occurs and the public demands improvements changes may occur. There is an immediate need for coordination between state and city transportation departments. Some minor recommendations may alleviate peak traffic congestions such as traffic light coordination, staggered work shifts, or enhanced bus schedules (more buses, express routes, etc.), alternative transportation methods, and enforcement of HOV violations. The limited land resources make expansion of most roads economically and logistically difficult.

Airports

The Honolulu International Airport was constructed based on optimistic projections of demand from the 1970-80's. A slower than projected growth in tourism as well as acceptance of international and mainland flights to outer islands leaves HIA with capacity. The effects of 9-11 have caused increased security that has changed flight travel expectations creating long lines at security and decreased sales for retail spaces. There is a need to maximize lease space and organize the facilities to efficiently move people by upgrading and expanding cargo facilities and reducing curbside traffic congestion.

Harbors

Honolulu Harbor is at capacity with strong competition for the limited number of berths and multiple uses for existing berths. Barbers Point Harbor should be improved to handle additional cargo ship arrivals and boat repair and maintenance facilities. Improvements should be made to the cruise ship arrival area and "tour boat" area. Proposals for re-opening of Keehi Channel should be coordinated with operations at Honolulu International Airport. Improvements in cargo terminals and on site storage are needed at Honolulu Harbor. Harbor administrative operations should be consolidated to one location.

Parks

Crowding is generally due to inadequate or undeveloped park acreage, facilities and amenities. Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. In the highly urbanized areas other sources of open space development are needed as acquisition of additional green space is economically infeasible. In high growth areas park dedication requirements should be enforced to ensure developers build neighborhood parks. Limited availability of coastline requires park lands be developed in mauka locations.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Honolulu County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

Police, Fire and Emergency Services

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

Unfortunately, the number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Response to major traffic incidents is slow and causes traffic congestion. New threats in national security have increased the need for special personnel and equipment to respond to terrorism threats and HAZMAT.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities.

Increasing visitor awareness of various local hazards (heat stroke, getting lost on trails, ocean hazards) may reduce the number of tourist related incidents.

Private Infrastructure

Visitor Accommodation

Visitor accommodations are privately owned and operated and development is in response to industry demand. Since Waikiki is considered built-out, expansion is being encouraged in downtown Honolulu and Kapolei areas. Generally development has been slow outside of Waikiki. Within Waikiki emphasis is on renovation of existing inventory.

Private Transportation

Information on Private Transportation is difficult to get from privately held companies. This sector is heavily utilized by the visitor population and the assumption is that it will expand as demand requires. Information was limited to tax and licensing numbers.

Energy Systems

Growth is projected for Honolulu, Ewa, and Central Oahu and will create an increased demand for power. Additional power generation sources will be necessary in the future however as development continues to cover Oahu there will be difficulty in citing power generation facilities away from urban areas. Emphasis should be placed on demand side energy conservation programs as well as developing alternative sources of energy.

Sewer Systems

The Sewer Systems indicator was combined with Sewage. There is a need to connect those household still having cesspools with county facilities.

Environmental Features

Coastal Water Quality

The coastal water quality around Oahu is generally good. The major threat to the water quality is from non-point source pollution such as urban and agricultural run off. The waters off of Waikiki are exceptionally clean considering the highly urbanized land

environment. The Ala Wai Canal is created with absorbing and filtering the majority of the areas non-point source pollution. Containment or treatment of storm water runoff should be used to ensure the high quality of Oahu's coastal waters.

Marine Ecosystem Health

The Marine Ecosystem Health indicator was combined with Coastal Water Quality.

Forestry / Green Space

Urban green space areas should be enhanced through planting of trees and landscaping. Mauka areas of forestry should be maintained for their significant watershed and recreational contributions. In urbanized areas where green space is not easily expanded there is an emphasis on open space such as plazas where alternative open air experiences can occur.

Air Quality

Though Oahu enjoys excellent air quality. Most air quality concerns occur in times of Kona weather and are caused by volcanic activity. Encouragement of alternative forms of transportation can contribute to a reduction in emissions and improvement in air quality in urbanized areas.

Beach Erosion

Beach erosion is a natural phenomena that is accelerated by human impacts. The Island of Oahu has the highest rate of beach erosion in the state. More research on beach erosion and better management practices to control the process are needed. Reduction of shoreline hardening through increases in building setbacks and removal of illegal structures are recommended. The use alternative methods of structure and dune protection such as beach replenishment should be considered before shoreline hardening occurs.

Invasive Species

Increased public and visitor awareness of the damaging effects of invasive species is considered the most effective means of controlling invasive species. Enforcement of quarantines and more thorough inspections of materials entering from areas known to have invasive species is necessary. The eradication programs and monies of government and various special interest groups should be coordinated to reduce the duplication of efforts.

Other Appropriate Natural and Scenic Resources

Oahu has many natural and scenic resources that must be protected.

Riparian / Wetlands

Non-point source pollution is biggest environmental threat to island wetlands. Invasive species are more prominent in coastal areas (wetlands) than at higher elevations; thus decreasing the effect of wetlands as an ecological water filter.

Native Species / Extinction Issues

Native species are threatened by habitat destruction and through competition for food from invasive species. Emphasis should be on protection of ecosystems as a whole instead of particular individuals or species. Increased funding is need for research and sampling/propagation of threatened species. Encourage the use of native plant species that are adjusted to Hawaii's climate as compared to water thirsty plants and invasive species. Amnesty bins programs should be expanded.

County of Hawaii

Public Infrastructure

Terrestrial Water Supply Quality and Quantity

Overall, there is more supply than demand for terrestrial water. However, West Hawaii, the driest part of the island, and the area with the lowest recharge is also the area with highest growth. The Kohala and Kona areas will see water restrictions before the rest of Hawaii, if exploratory wells with their corresponding distribution infrastructure do not keep ahead of demand. Aquifer levels will also need to be monitored to note any serious aquifer depletion. This could be a possible constraint for the visitor industry and development.

Sewage

The Hilo and Kona regions have community sized wastewater treatment facilities, which currently are adequate for their wastewater disposal needs. The other regions in Hawaii County depend on on-site wastewater disposal systems and cesspools, which in most cases do not satisfactorily treat the wastewater.

It is recommended that a Hawaii County wastewater feasibility study be developed. The study should include the estimated future growth, development trends, a cost analysis for any proposed infrastructure, and a review of existing on-site wastewater disposal systems. The feasibility study would aid in the recognition of deficient areas of treatment and in the placement of future infrastructure.

Solid Waste Disposal

The County of Hawaii Solid Waste Division is faced with many challenges. Both the State and County failed to meet the waste reduction goals for 1995 and 2000; the program is operating at a loss, the tipping fees only account for 35% of the Divisions

budget; and illegal dumping of solid waste continues to be a problem. These challenges are being met with the encouragement of recycling programs, the consideration of curbside pickup, and tipping fees that are more in line with the actual cost of solid waste disposal.

It is recommended that a solid waste option plan be developed to provide potential alternatives and solutions to the existing problems. The plan should evaluate the existing transfer stations. A review of the transfer station locations and their usage should be considered. The study should consider potential ways to upgrade some of the transfer stations so waste could be compacted on site and more efficiently transferred to the landfill.

Storm Water

The County of Hawaii has recognized many of the challenges it faces and has outlined a comprehensive list of future requirements. The changes the County is considering include but are not limited to a revision of the Drainage Master Plan, a review of land use policy as it relates to flood plain, high surf, and tsunami hazard areas.

No recommendations for Hawaii County Storm Water are forth coming at this time.

Roads

Federal and state funding for transportation projects are waning. It is recommended that alternative funding sources be identified for future maintenance and new infrastructure.

The Long Range Land Transportation Plan for the island of Hawaii, which identifies major transportation improvements to support projected growth through the year 2020 should be implemented.

Airports

Airports in the County of Hawaii are capable of meeting projected passenger demand. Hilo Airport was built with expectations of more passengers from overseas than it currently has. Monies should now be spent toward improved cargo facilities on East Hawaii to support the diversified agricultural industry, especially the export of papayas, coffee and flowers.

Harbors

It is recommended that the improvements outlined by the Harbors Division be implemented at both Hilo and Kawaihae Harbors. Hilo harbor should provide the same level of service as large harbors on the island of Oahu. There is little discussion regarding improvement to cruise ship terminals and facilities. This is an area of further study, as cruise ships are a growing segment of the visitor industry.

Small boat harbors in Hawaii are heavily utilized. Currently, there is a waiting list for mooring spaces. It is recommended that the small boat harbors charge comparable

rates as those seen at private harbors. The increased revenue would allow for better maintenance and potentially provide new facilities to decrease the waiting list. It is important that sufficient funding is generated for future renovations and repairs.

Parks

Crowding is generally due to inadequate or undeveloped park acreage, facilities and amenities. Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. Recreation programs requirements need to be taken into account in the developmental stages of the park planning process.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Hawaii County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

Police, Fire and Emergency Services

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

The number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Another reason is the enormous physical area with scattered settlements. Arriving at a scene in a timely manner is challenging.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities. Correlation between demographics and geography may shed light on differences between resident and visitor usage of emergency services.

Private Infrastructure

Visitor Accommodation

Monitor growth in west Hawaii to assure that it does not outpace existing infrastructure capacities.

Private Transportation

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii County. Nevertheless, as privately run businesses, the industry will tend to expand to meet the demands of service calls.

Recommend monitoring of private transportation and data collection if a more thorough evaluation is desired.

Energy Systems

West Hawaii is the fast growing area in Hawaii County. As such, a new power source is needed. HELCO has been searching for a power plant site on West Hawaii since the 1980s. They have met with strong opposition. The County Council has recently approved rezoning of a site in West Hawaii for the near future development of a power plant. This could be a possible constraint to the visitor industry.

Energy systems recommendations are to fast track the additional power source once a site is approved; other considerations are energy conservation and utilization of more alternative and renewable energy sources.

Sewer Systems

Many of the private sewer systems are owned and maintained by the resort management companies. Aside from information gleaned from environmental impact statements, information regarding sewer systems is not found in county documents.

Recommend monitoring of private sewer systems and data collection if a more thorough evaluation is desired.

Environmental Features

Coastal Water Quality

The coastal water quality for Hawaii is excellent except when impaired by severe storms, cesspools and construction where best management practices were not followed. Recommendations include the provision of educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment.

Marine Ecosystem Health

Recommendations include providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment. Also recommended is the creation of more marine conservation areas. The conservation areas would circumvent the problem of over fishing along the coast, which creates localized depletion of various marine biota.

Forestry / Green Space

Recommendations for forestry include that more funding be directed toward the maintenance and upgrading of forest reserves and trails. The condition of the forest reserves directly effects water quality within the watershed.

Air Quality

The biggest threat to air quality in Hawaii County is volcanic related haze and fog. The direction and speed of the tradewinds can help or impede the problem, depending upon one's location relative to the source. The majority of the time the tradewinds efficiently diffuses and reduces the intensity of the vog.

Recommendation includes continued monitoring of air quality.

Beach Erosion

There is insufficient information to provide accurate recommendations at the County level. Recommendation is for additional research for two purposes – to establish a baseline data set for beach erosion and to give support to management and their policies and practices.

Invasive Species

Recommendations include maintaining and enforcing the quarantine program and review the quarantine and noxious species law. Coordination of manpower and funding by formulation of a consortium of governmental and other interested parties can maximize resources. Identification of infestations and regular performance assessments of the successes and failures of eradication programs can aid in stopping the spread of problems.

Also recommended is the garnering of public support for programs, though public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

Other Appropriate Natural and Scenic Resources

There is insufficient information to provide detailed recommendations at the County level, however it is recognized that the aesthetic pleasing features of Hawaii attract many tourist each year. Recommend that scenic resources be reviewed by public input until more quantitative measures are utilized.

Native Species / Extinction Issues

The Invasive Species Committee is a new organization. Recommend monitoring their progress in the fight against invasive species.

Riparian / Wetlands

Only recently has the status of the state streams been brought to light. Recommend continued monitoring of the preliminary research and actions will help ensure the restorative programs stay on course.

County of Maui

Public Infrastructure

Terrestrial Water Supply Quality and Quantity

It is recommended that maximization of existing water sources by expanding storage capabilities be done. Management of the County's growth activities should be consistent with the water use and development. There is a need for continuing encouragement of water conservation practices by the County's residents to enable the most efficient use of existing water system sources and facilities. There is also a need for improvement of water transmission to areas that experience critical water supply and to seek new sources of water by exploration in conjunction with other government agencies.

Within each planning community, a comprehensive water management strategy must be developed to balance between the various interests and accommodate environmental, agricultural, and residential needs of all neighboring regions. There are limited development of water resources and distribution system to meet the needs of the region. There are concerns over the development of new ground water sources in Haiku and their reallocation of this resource to service other regions of the island. Exportation of resources found within the Hana Community includes the diversion of surface water from the region.

Sewage

The wastewater treatment facilities for Maui County are approaching their design capacity, which could potentially constrain future growth and development. With the continued growth on the island, the development of new wastewater treatment facilities will be needed to meet the new demands. Working with private landowners and exploring the possibility of entering into a partnership may develop additional transmission and treatment capacities.

Solid Waste Disposal

The Maui County General Plan recommends a comprehensive waste management program, which includes waste reduction, recycling, composting, and energy recovery/utilization. Consideration should be taken of environmental impact when developing new disposal sites. Additional recommendations include setting up convenient centers within the individual communities for recycling and reuse of solid

waste and incentives for private business to establish operations within the county that promote reuse of disposed household items.

Storm Water

There was not enough information available to adequately evaluate and make recommendations for this infrastructure element. Further information is needed to be made available.

Roads

Transportation is one of the major concerns in Maui County. However, policies developed in adjoining community plan regions should be consistent with the desire of surrounding communities to preserve the natural and cultural characteristics.

Problem areas include Kahului, Kihei and Lahaina. Kahului, as the center of commerce and hub for transportation routes often necessitates that people travel through Kahului to get where they want to go. The addition of alternate routes would alleviate much of the traffic through Kahului. Piilani Highway has alleviated much of the east-west traffic through Kihei; however, an alternative route is needed for north-south moving traffic. To relieve traffic in and around Lahaina passing lanes and a bypass are needed.

Airports

The islands of Maui, Molokai and Lanai are dependent upon outside sources for goods. There is a need to improve air transportation to and from each of the islands, especially air cargo facilities.

Alternative designs for Kahului airport expansion should be proposed to accommodate public opposition to the expansion of road to the airport. Expansion should include the need to upgrade cargo facilities.

Harbors

As stated previously, as islands, Maui, Molokai and Lanai are dependent upon outside sources for goods. There is a need to improve and expand harbor facilities, for both cargo and cruise ships, on Lanai, Maui and Molokai. An upgrade at the Lahaina dock for visitors arriving by cruise ship is recommended. Improvements to the ferry terminal on Maui and Lanai would accommodate shuttles, water taxis and the ferry landing between Maui and Lanai.

Parks

Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by their assets and/or public needs assessment. Recreation programs requirements need to be taken into account in the developmental stages of the park planning process. One concern is that recreational needs not provided for in other community plan regions may result in a spillover effect into the Hana region. A concern for Lanai is the need for additional recreational

facilities and services. Public park facilities in some regions are inadequate and in need of expansion and improvements. Existing public beach parks are well utilized and do not adequately meet public demand. The improvement and expansion of park facilities in the region have not kept pace with resident population growth.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Maui County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

Police, Fire and Emergency Services

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

Unfortunately, the number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Another reason is the enormous physical area with scattered settlements. Arriving at a scene in a timely manner is challenging.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities. Correlation between demographics and geography may shed light on differences between resident and visitor usage of emergency services.

Private Infrastructure

Visitor Accommodation

Maui is predominantly geared toward the deluxe/luxury resort setting, while Molokai and Lanai are mostly hotels. The main recommendation for visitor accommodations is monitoring of current accommodations and appropriate planning for future developments.

Private Transportation

There is insufficient information to adequately make recommendations for this infrastructure element.

Energy Systems

Maui, as part of the State, is heavily reliant upon fossil fuels. It is recommended that a more self-sufficient approach be taken toward energy production. Conservation programs and renewable energy sources should be explored.

Sewer Systems

Sewer systems information is largely combined with public sewage. Information for individual sewer systems was not available. See Public Infrastructure, Sewage Recommendations.

Environmental Features

Coastal Water Quality

As non-point source pollution is the greatest threat to coastal water quality, it is difficult to make coastal water quality recommendations without any information regarding storm water.

Ensure that best management practices are utilized to reduce the possibility of chemicals entering the water.

Marine Ecosystem Health

Concerns regarding the carrying capacity of heavily used ocean recreation areas, like Molokini, are legitimate. Further study is required to determine the type of impacts heavy usage incurs upon more frequently used areas. Monitoring and the issuance of permits may be a recommendation of such a study. Another option is establishment of marine conservation areas for protection.

Forestry / Green Space

Preservation and restoration of native forests is in the best interest of all stakeholders. Forests are the natural filters for groundwater, so in preserving forests, the groundwater quality is also preserved. Healthy forests also supports native species. Coordinated efforts between all stakeholders are recommended in conjunction with invasive species issues. These two issues are intertwined and should be treated together.

Air Quality

Air quality on Maui is above federal and state standards. The major concern regarding air quality on Maui is when the sugarcane is burned. In general, vehicular emissions have not been a problem. Continued monitoring is recommended.

Beach Erosion

As recommended at the State level, further research is required to study and develop appropriate management strategies for each area. Appropriate building setbacks and other policies need to be implemented and enforced.

See Hawaii State Recommendations for additional Beach Erosion Recommendations.

Invasive Species

There are two primary recommendations regarding invasive species, coordination and eradication. Coordination between governmental agencies and other stakeholders will minimize duplication of efforts and maximize funding. Eradication involves eliminating what can be eliminated and containing what cannot be wholly eliminated.

Other Appropriate Natural and Scenic Resources

Efforts are underway in various planning communities to restore environmental resources, including native vegetation. It is recommended that the natural and agricultural settings be maintained and enhanced.

Riparian / Wetlands

See Coastal Water Quality recommendations.

Native Species / Extinction Issues

Restoration and preservations of native forests will benefit native species. As a whole, the County of Maui is progressive in its response to invasive species and protection of native species. Lanai has little native vegetation remaining and of what is remaining, it is threatened.

County of Kauai

Public Infrastructure

Terrestrial Water Supply Quality and Quantity

Water quality and quantity for the Island of Kauai are acceptable at the current time. The amount of water being recharged exceeds the volume of water being used. Proactive measures to educate the public and well drillers should be taken to assure proper well drilling practices to avoid potential ground water contamination.

Kauai's water system faces some challenges for the immediate future. Water loss due to line leakage is commonplace. Aging and remotely located transmission and service lines make it difficult to keep up with the necessary repairs. Additional water supplies will need to be tapped to accommodate any growth. It is recommended that a thorough study of the water system infrastructure should be performed and a timeline to repair/ replace outdated water lines should be prepared.

Sewage

As recommended in the Kauai General Plan, 2000 the County of Kauai should develop a master plan for wastewater treatment focusing on strategic issues and funding priorities. The plan would provide direction to the program and provide a higher level of certainty for potential service customers.

It is recognized that the County has unused capacity in three of its four plants. It is also understood that connecting additional customers would increase revenues to the wastewater program at marginal cost for increased plant operations. However, Kauai County should complete a wastewater master plan prior to approving new development. This would insure that existing development can and will be served.

A review of the locations and frequency of failing on-site liquid waste systems should be tracked. The information should be used to make informed decisions about expansion of community wastewater collection systems.

Solid Waste Disposal

The remaining life in Kauai's landfill is five to six years. Therefore, a new landfill site should be identified within the next year. Other alternatives to a new landfill should be considered, such as a resource recovery facility. The facility could provide electrical power and substantially reduce the volume of waste put in the landfill.

Because the number of visitors can be as great as 25% of the island population, programs to educate visitors about recycling should be considered. Hotels and visitor accommodations should provide their guest with convenient ways of recycling.

Storm Water

It is recommended that rather than prepare a "master plan" for the island, the Department of Public Works focus on specific problem areas and watersheds, with the objective of developing strategic plans that specify preventive as well as remedial actions.

It is also recommended that the County's drainage standards be revised to provide adequate flood protection that is not structure-oriented, and to reduce polluted runoff in accordance with State and Federal non-point pollution management policies. The standards will guide future development and aid in avoiding future problems.

Roads

Potential highway improvements should at least be assessed for feasibility and desirability given Kauai County's policy to maintain rural character. It is recommended that Kauai County wait for the Department of Transportation that is planning to prepare an updated 2025 land transportation plan prior to authorizing the design and construction of new roads. Potential projects should be analyzed and rated in terms of feasibility. Options such as adding new roads rather than widening existing ones should be considered.

Airports

Though a runway extension is supported by the tourism industry to accommodate the larger planes used in mainland and international flights, the passenger activity level at the Kauai's primary airport in Lihue has decreased drastically in 2001 and tourism levels show slow growth for the island. Efforts to maximize revenue and customer service should be the focus of the airport. Concession and permitted development should be promoted and positioned in a logical manner to capture customer demand and increase services to the customer. Expanded customer offerings should target the inter-island traveler as Lihue Airport's main customer.

Harbors

The improvements necessary to accept the increasing passenger and cargo levels at Kauai's two commercial harbors in Nawiliwili and Port Allen are in berthing facilities and port infrastructure. The plans for these should be followed through. Pier extensions are needed to accommodate the increasing number of larger ships and barges serviced by the ports. Local infrastructure, especially roads and commercial space, must be improved and increased to support the higher level of activity.

Parks

The Hawaii Tourism Product Assessment identified Kauai's park amenities such as restrooms, picnic areas, and trails as not being properly maintained. The assessment suggested that better service and maintenance at public areas could be achieved through privatization of certain park areas.

Kauai's parks will continue to see increased usage. The current trend of ecotourism will divert more visitors towards the natural settings of Hawaii in particular the parks and beaches of Kauai. Increased use will inevitably lead to over crowding, stressing of the natural environment and overuse of the infrastructure facilities. Maintenance and new capital works need to be put in place to control any degradation of the park system.

Police, Fire and Emergency Services

The dispersed location of Kauai's resident and visitor populations stretches the limited resources of the police, fire and emergency services from one end of the island to the other. Outdated fire equipment and facilities and DOW water supplying infrastructure further compromise the abilities of the Kauai fire department. Recommendation is for additional funding to replace equipment and add satellite stations in locations consistent with long range growth plans.

Private Infrastructure

Visitor Accommodation

On Kauai, the supply of land designated for resort development is greater than the project demand under the 2020 scenarios discussed in the Kauai General Plan. Cost associated with development may be higher than other locations because of the

challenges created by limited public infrastructure (no island wide sewer or water service and limited road access due to light duty bridges). The desire expressed in the Kauai Vision is for the island to maintain its rural character and that visitor accommodations should focus on small scale and alternative forms of lodging.

Private Transportation

There is not enough information to adequately evaluate this infrastructure element. Data regarding private transportation would need to be collected to evaluate Private Transportation.

Energy Systems

Kauai Electric's distribution system is a typical radial system, and unlike KE's transmission looped system where there are at least two transmission lines feeding the major switchyards, if a distribution line is de-energized, there is usually an interruption of power. KE's radial distribution systems extend from substations to the load with no continuous backup. KE's distribution systems have alternate sources to feed an area, but brief outages occur due to switching that is necessary to reroute power from a different feeder or switchyard. It is recommended that the necessary redundancy be built into the system so interruptions in power can be avoided.

Sewer Systems

The Sewer Systems indicator has been combined with the Sewage indicator.

Environmental Features

Coastal Water Quality

While the currents surrounding the Island of Kauai move polluted water away from the coastal waters, the limited circulation of bay waters can cause them to become polluted. Non-point source discharges have a greater impact on streams and near shore waters than point source discharges. Control of water runoff from agriculture lands and urbanized areas such as the Nawiliwili and Port Allen harbors is an opportunity for the Island of Kauai. Kauai's unwritten policy to avoid construction of concrete-lined channels in preference of grassy drainage ways helps to improve coastal water quality. Procedures to further control non-point supplies and identifying point source sources, especially upland of streams and bays, should be taken.

Marine Ecosystem Health

Reefs along the Kauai coast show higher fish abundance and diversity than the other main Hawaiian Islands. The island has excellent and diverse fish habitats and fishing pressure is relatively low due to a smaller human population. The lack of Marine Life Conservation Districts and research on the reefs of Kauai presents opportunities for the island. Consideration should be given to promoting County specific research into marine ecosystem health and designating unique or popular areas Marine Life Conservation Districts. The excellent quality of Kauai's marine ecosystem is considered an essential component in the island's tourism product.

Forestry / Green Space

Hawaii's forests are an important source of recreational opportunities and water resources. Forest watersheds supply Hawaii with almost all of the fresh water Hawaiians need. For the County of Kauai, there is not enough county specific data to make a proper assessment of the forestry and green space indicator. The recommendation is for detailed County specific data.

Air Quality

Kauai's air quality meets federal and state environmental health standards because of the lack of major polluting industries and trade winds blowing the air pollution out to sea. The majority of air pollution on Kauai is currently attributed to agriculture operations; however, the increase in development especially the addition of diesel fired generating plants may change the source and content of air pollutants in future years. Consideration should be given to increasing the number of monitoring sites and the diversity of their locations.

Beach Erosion

Coastal erosion does not impact the Island of Kauai to the same extent that it does the other more heavily developed islands of the State of Hawaii. The lack of a present threat to beach health may be the reason the County of Kauai maintains a 40-foot setback for coastal construction while other Counties have increased their requirements. Consideration should be given to increasing the shoreline setback for the Island of Kauai especially in the more developed and sensitive areas of Poipu Beach, Haena and Hanalei Bay. The County of Kauai should continue permitting, monitoring and enforcing codes relating to construction in Special Management Areas especially those impacting seawalls, eroding shorelines, and beach accesses. High quality of beaches and access to them is considered essential to Hawaii's visitor industry.

Invasive Species

Most invasive species of flora arrive in Hawaii via introduction for horticulture use for ornamental purposes. Education of suppliers and residents is the most effective means of controlling invasive species introductions and preventing new potentially devastating alien species from coming to Hawaii. Once established containment and eradication become the more challenging task. The Island of Kauai has been cleared from incipient Miconia populations. The recommendation is for a strong community education program and survey of lowlands, the principal points of entry of most introductions to the Islands, and higher elevations where non-tropical ornamentals may flourish.

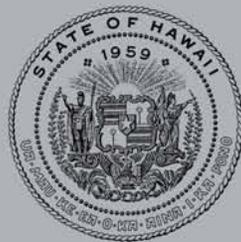
Other Appropriate Natural and Scenic Resources

Kauai is known for scenic beauty and variety in landscapes. Kauai is the only county that dedicates a section of its General Plan entirely to scenic resources. These features attract visitors from around the world, and therefore, have an economic value. The Kauai General Plan states the goal of Kauai to retain the cultural and economic

value of various landscape features. The recommendation is for the Planning Department to provide specific criteria and guidelines for evaluation and protection of scenic views.

Native Species / Extinction Issues

Hawaii has one-third of the endangered species in the United States, and invasive alien species pose the greatest threats driving these and other native species toward extinction. For Kauai, there is not enough county specific data to make a proper assessment of the Native Species / Extinction Issues indicator. The recommendation is for detailed County specific data.



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